

# IABSE COLLOQUIUM STOCKHOLM 1986

*Thin-Walled Metal Structures  
in Buildings*

*Structures métalliques à parois minces  
dans les bâtiments*

*Dünnwandige Metallkonstruktionen  
im Hochbau*

POSTER SESSIONS

International Association for Bridge and Structural Engineering  
Association Internationale des Ponts et Charpentes  
Internationale Vereinigung für Brückenbau und Hochbau

IABSE  
AIPC  
IVBH

## Introduction

The IABSE Colloquium «Thin-Walled Metal Structures in Buildings» was held in Stockholm from June 9 to 11, 1986. It was attended by 175 participants from 26 countries.

Organizer was the Swedish Group of IABSE in cooperation with the European Convention for Constructional Steelwork and the Swedish Institute of Steel Construction.

The main themes of the Colloquium were:

- Theme I Thin-Walled Components, New Developments in Theory and Practice
- Theme II Light-Gauge Metal Construction and Building Systems
- Theme III Composite Light-Gauge Metal Construction
- Theme IV Building Physics in Light-Gauge Metal Construction

As a basis for the working sessions of the Colloquium served a report, Proceedings, containing 56 written contributions. The report is available from the IABSE Secretariat in Zürich (IABSE Reports, Volume 49).

During the Colloquium an exhibition of posters was arranged where the authors had the opportunity to present and discuss their contributions with smaller groups of particularly interested persons.

The 17 contributions to these Poster Sessions are reproduced in the present brochure together with supplementary information from the authors.

Of the posters 8 relate to theme I, 4 to theme II, 3 to theme III and 2 to theme IV. In the brochure the contributions are arranged accordingly.

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## Analysis of Three-Layered Polymer-Concrete Steel Beams

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The aim of the research was to determine the loss factors of the sandwich beams consisting of two metal faces and a core made of polyester-concrete, regarding various concrete thicknesses, and their load-carrying capacity. The static behaviour of the beams is characterized by stress-strain curves, the elastic modulus of the concrete and the admissible stress. We used the forced vibration technique to examine the dynamic behaviour of beams with the Brüel-Kjaer devices. The loss factors of beams have been determined according to Oberst for various stresses and eigenfrequencies. The loss factor and the dynamic shear modulus of the polymer-concrete were measured by the Jones-method. The results make it possible to calculate the loss factor of sandwich beams using the Ungar's formula and the eigenfrequencies of the beams by Yin.

It can be concluded that the polymer-concrete-steel beams may be used not only for static loads, but also for dynamic excitations. The loss factors of the beams ( $\eta$ ) were between 0.01-0.11. Fatigue tests have been carried out to determine the fatigue behaviour of core and connections between layers.

1. OBERST H.: Über die Dämpfung der Biegeschwingungen dünner Bleche durch fest haftende Belage. Akustische Beihefte 1952. No. 4. pp. 181-194.
2. JONES D. G., PARIN M.L.: Technique for measuring damping properties of thin viscoelastic layers. Journal of Sound and Vibration, Vol. 24. No. 2. 1972. pp. 201-210.
3. UNGAR E.E.: Loss factors of viscoelastically damped beam structures. Journal of the Acoustical Society of America, Vol. 38. 1962. pp. 1082-1089.
4. FARKAS J., JÁRMAI K.: Structural synthesis of sandwich beams with outer layers of box cross-section. Journal of Sound and Vibration, Vol. 84. 1982. No. 1. pp. 47-52.
5. YIN T.P., KELLY T. J., BARRY J.E.: A qualitative evaluation of constrained-layer damping. Trans. ASME J. Eng. Ind. Vol. 89. 1967. pp. 773-784.



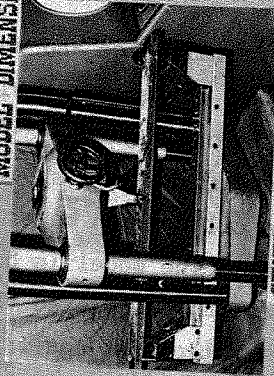
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MATERIALS  
HANDLING  
EQUIPMENT.  
MISKOLC  
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# ANALYSIS OF THREE-LAYERED POLYMER-CONCRETE-STEEL BEAMS

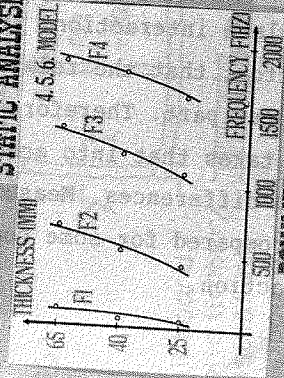
K. JÁRMAI

LENGTH	200 MM	END CONDITIONS
WIDTH	75 MM	FREE-FREE, CLAMPED-CLAMPED
THICKNESS		MODEL NO.
3-25-3 MM	1	4
3-40-3 MM	2	5
3-60-3 MM	3	6

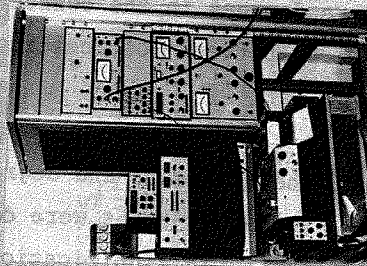
## MODEL DIMENSIONS



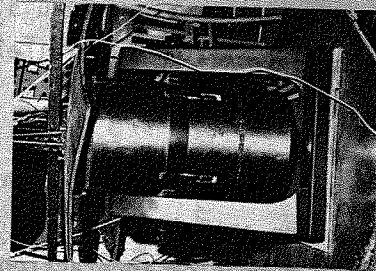
## STATIC ANALYSIS



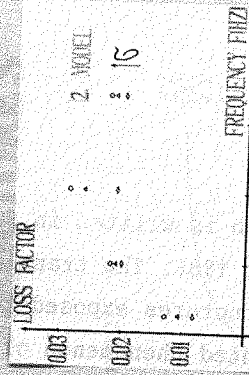
EFFECT OF POLYMER-CONCRETE THICKNESS ON FREQUENCY



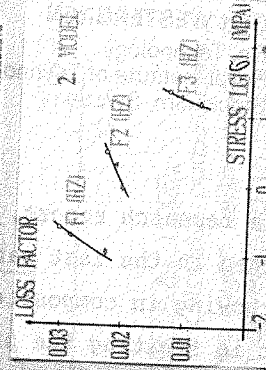
MEASURING EQUIPMENT



DYNAMIC ANALYSIS



## EIGENFREQUENCY DIAGRAM



## LOSS FACTORS



FATIGUE EFFECT